Community Impact of Science Centers: Is There Any?

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ABSTRACT

In a competitive environment, established cultural institutions need to justify their activities and to provide measurable indications of success when applying for public and private funds. Science centers are part of the movement striving to enhance public understanding of science. The educational aspects of science centers have been the subject of numerous studies, while there is much less tangible information on the economic, political, or public impact of our institutions. There is clear evidence that learning behaviors occur in non-formal settings. Crude assessments of the economic contribution by a cultural institution to the local economy can fairly easily be made. These include the direct purchasing power of the institutional budget and the salaries that the employees get, and an estimate of the direct costs related to the visits. An indication of the impact on local communities may be estimated from the attendance figures as a percentage of the total metropolitan population. Science centers tend to attract media attention for the exhibitions, programs, and events that they stage. This can be measured. The impact on the local economy, on political agendas, and on public perception of science has been only rudimentarily studied. Methods have not been developed, nor have the critical questions been clarified. More research, including compilation of existing scattered proprietary data, is needed. An active role in promoting a research agenda, or at least in compiling and accessing relevant data, could be taken by the professional organizations of science centers.

INTRODUCTION

In a competitive environment, established cultural institutions, such as museums and science centers, are requested to justify their activities and to provide measurable indications of success when applying for public and private funds (Karp and Lavine 1993). Science centers as well as other cultural institutions will have to address the question of their impact on the communities in which they function. In what ways do we provide a public service? What is the value provided by our activities? Do we have a measurable effect on the society at large? Can we justify our case?

This contribution is a discussion paper outlining areas where more studies are urgently needed. My case is simply that the educational aspects of science centers have been and are the subject of numerous studies, while we possess much less tangible information on the economic, political, or public impact of our institutions.

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The viewpoint is not that of an academic in the field, but rather that of a solid practitioner. Part of the problem is data accessibility: in many cases, surveys have been done for the needs of specific institutions, but they have not been published (Persson 2000a).

For the present purpose, the definition of a science center is broad: Any institution providing access to the public for the purpose of popularizing science and using an exhibition as at least one of its tools could be included. Science centers aim to explain science and technology to non-experts. They typically use interactive exhibits, involving their visitors in active experimentation. While the exhibits of science centers are often described as *"hands on,"* they certainly aim to be *"brains on"* or *"minds on"*: starting intellectual processes, solving problems and providing answers.

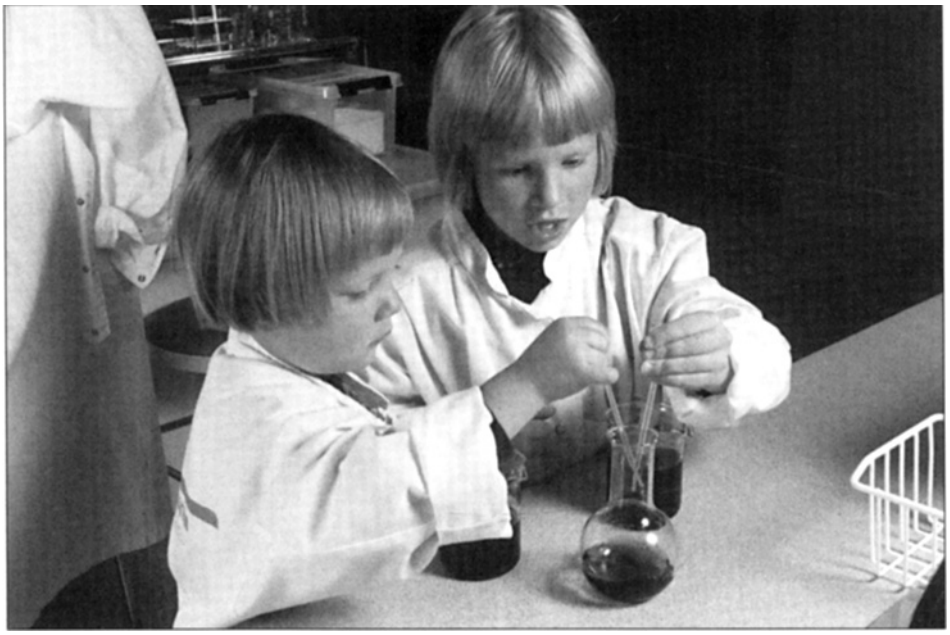

Figure 1. Young chemists at work. Visitors to the Children's Laboratory don white lab coats while they perform simple experiments. *Photo by Kirill Lorech, Heureka.*

Science centers are part of the movement striving to enhance public understanding of science. The rapid establishment of new science centers around the world during the last decades and the size of the industry today imply a popular appeal. Science centers are forums, where the scientific community, industry, the formal education system, and the public may meet (Persson 2000b).

Data presented at the 2nd Science Center World Congress in Calcutta, India, in January 1999 gave the following picture of the global science center movement:

Table 1. Science centers by geographic region.

Area	Major centers	Other centers
North America	313	–
Europe	202	50
Latin America	25	50
India	27	5
China	30	200
Rest of Asia	20	230
Africa	13	5
Total	630	540

The *"other centers"* in the table are mainly small institutions that often are not members of international networks. The Chinese estimate has been given by the China Science and Technology Museum in Beijing. The figures for *"Rest of Asia"* include the 150 members of the Japanese Association of Science Museums.

Thus, there are around 1,200 science centers and science museums in the world today, visited by more than 184 million persons each year. They have an economic turnover exceeding $1.4 billion. Many science centers rank among top tourist attractions in their respective countries. Almost one third of the American population pays a visit to a science center every year. The corresponding figure for Great Britain is 16 percent, for Scandinavia 10 percent, and for India 0.5 percent (Persson 1999). The figures show that science centers have a popular appeal, i.e., that large numbers of people seem to find it worthwhile to pay them a visit.

However, as Karp and Lavine (1993) point out, mere visitor numbers do not describe the relevance of a cultural institution. The quality of the experience is important, as well, and it is affected by several factors.

Learning Impact—Traditionally, the question of impact of science centers has dealt with the learning issue. Today, a fairly sizable literature on non-formal learning exists (e.g., Hein 1998), and there is clear evidence that learning behaviors occur in non-formal settings. In museum studies, learning is often understood in the experience-based or constructivist sense of Dewey (Ansbacher 1998).

Figure 2. Children can listen to nearly 70 different languages at the language globe. *Photo by Kirill Lorech, Heureka.*

Learning in a science center is informal, and care should be taken when studying it that the methodology does not impose restrictions on the outcome. Informal learning is highly personalized and depends on visitor agendas. In recent studies, effort has been taken to define learning behavior in a way that is not predetermined by the researcher (Barriault 1998). The approach has yielded interesting results in uncovering learning behaviors and relating them to depth of learning.

Falk et al. (1998) and Falk (1999) have pointed out that the museum experience needs to be studied in the context of the visitor, relating a visit to a museum to the entire visitor agenda of that day or life cycle.

A perusal of the literature shows that learning behaviors can be discerned in several studies (Stevenson 1991; Borun et al. 1995; Serrell 1997). A museum visit may be recalled after years or decades (Falk and Dierking 1992). There is a lot of interaction in social groups, such as families. Science centers seem to do quite well in the affective portion, influencing and enhancing motivation (Salmi 1993; Meredith et al. 1997). In addition to the published literature, there is a great number of internal exhibit evaluation reports in various science centers, which often include interviews with visitors, and which support an overall conclusion that visitors seem to learn in science centers (Persson 2000a).

The positive learning impact may affect career choices by students (Woolnough 1994). Surveys in Australia and in Finland have shown a measurable influence of

Figure 3. Young visitors manipulate geometric elements to construct diverse shapes. *Photo by Kirill Lorech, Heureka.*

science centers on career choices by university students (Coventry 1997; Salmi 2000). Incidentally, both reports are examples of the unpublished, internal-circuit reports in various institutions that contain interesting and relevant data. This literature should be made accessible to the profession. Perhaps the Association of Science-Technology Centers could launch a clearing house for proprietary information on the Web?

Economic Impact—There are surprisingly few studies on the economic impact of cultural institutions. A partial list can be found at the Web site <http://www.artsusa.org/clearinghouse/>. Among the references listed, Urwick, Currie, and Partners (1974) did a study on the economic impact of three major Canadian cultural institutions in 1972. They reported a total economic impact of $7.8 million (Canadian) on Canadian society by these institutions.

The study by Baumol in 1975 on the impact of Broadway theaters on the surrounding economy in New York indicated a major influence on the tourism trade, totalling $168 million in the metropolitan area. The estimated annual contribution by the theater visitors to restaurants was $45 million, to taxis $10 million, and for parking $4 million. The study was performed during an eight-week strike in major theaters, making direct comparisons possible.

Studies by the Alliance of Resident Theaters in New York in 1995–1997 show that the 5.2 million individual audiences of 133 member theatres generated $99 million in revenues to neighborhood restaurants, parking garages, and stores. The theatre budgets represented another $101 million.

Crude assessments of the direct and indirect economic contribution by a cultural institution to the local economy can fairly easily be made. At a minimal level, this includes the direct purchasing power of the institutional budget and the salaries that the employees get, and an estimate of the direct costs related to the visits (transportation, food and beverage, accommodation, entrance fees, purchases in the souvenir shop). There are very few published reports with such data, however (Persson 2000a). Again, the problem seems to be how we can make this proprietary information professionally available.

In many tourism surveys the daily spending of different categories of tourists is calculated. For instance, in Vantaa in Finland, an average leisure tourist spends about $60 while a congress participant usually spends about $200. With these data, rough estimates of the economic contribution by the science center attendance can be made. In the case of Heureka in Finland, these calculations would translate into a direct cost paid by the visitors for their physical visits of around $4 million. Assuming the attendance contains 8 percent international and 42 percent domestic leisure tourists, there would be an additional annual impact of at least $5 million. When the actual Heureka operating budget is added to this, the economic impact of Heureka on the local community amounts to about $15 million. This can be compared with the amount of direct subsidies from the municipality and national government, $3 million.

It would be clearly beneficial to develop a database for the economic impact of science centers on the local communities. This would enable comparisons between localities and institutions. Before such a database is accomplished, some basic research is needed, *inter alia*, to clarify how the calculations should be performed. Here, our branch organizations, such as the Association of Science-Technology

Centers (ASTC), the European science center network (ECSITE), and others, could take a lead.

Political Impact—A major cultural institution exerts an influence on its environment, largely because of the tangible or intangible benefits that are perceived as emanating from it. For science centers, a role in education and as a tourist attraction would be typical examples (Persson 2000a). This produces an interest among the decision makers in the community and a need to take care of the basic interests of the institution.

The stream of visitors represents an economic value and, therefore, other institutions or commercial facilities may be attracted to the area. This again produces changes in land use patterns and may influence urban planning. I think most major science centers would agree that their institutions have influenced local land use patterns at least to some extent (traffic, parking lots, parks, etc.).

Many science centers have been established as a part of an urban redevelopment scheme, by which usually derelict land areas (run-down industrial zones, old city centers, etc.) have been revigorated. In addition to science centers, other cultural institutions as well as commercial enterprises (restaurants, shops, hotels) may be involved. Examples include Techniquest science center in Cardiff, Wales, Citta della Scienza in Naples, Italy, and many Indian science centers. In India, several science centers represent the ultimate in urban redevelopment, as they have been established on old garbage dumps.

An indication of the impact on local communities might be estimated from the attendance figures as a percentage of the total metropolitan population. Again, comparable data sets may be difficult to obtain as definitions of metropole may vary. There is a clear variation between different cities and institutions, as shown by these few examples:

Table 2. Science center attendance.

Institution	City	Attendance % of metropolitan population
Heureka	Helsinki	30
Science Museum	London	13
Deutsches Museum	Munich	78
Experimentarium	Copenhagen	30
Palais de la découverte	Paris	20

Ultimately, one way of measuring the political interest in science centers is to estimate the amount of public funds used to support them, if costs for land use development are included. Clearly, this is an area where practices of accountancy may vary enormously, and therefore, comparable data may be difficult to compile. Therefore, I think the best way to document the political interest is simply to describe actual cases. All measurements need not be quantitative.

Public Impact—Science centers tend to attract media attention for the exhibitions, programs, and events that they stage. This attention focuses on both the venue (the center and the community) and on science itself. Many science centers run public lecture programs (e.g., Deutsches Museum, Heureka, Palais de la Découverte), often executed by renowned scientists. The media attention can be surveyed and measured. At Heureka in Finland, an index for the coverage in printed media has been developed, the Heu index (Persson 1993). One Heu equals one billion subscriber-column millimeters. It measures reader attention received. Typical values of exhibition publicity during the opening month have been 4–5 Heu, and occasional program events (children's science days, spectacular lectures) may reach 1–2 Heu. The method is similar to that which is being used in marketing research. If extended to electronic media (viewer time or simply viewer numbers), a useful method might be developed.

The public impact by science centers has usually not been addressed. In this area, there is a clear need to develop the methodology and to generate more research.

CONCLUSIONS

Science centers, as other cultural institutions, have an impact on their surrounding communities. While the educational impact has been studied fairly extensively, the impact on the local economy, on political agendas, and on public perception of these institutions has been only rudimentarily studied. Methods have not been developed, nor have the critical questions been clarified.

I believe a concerted effort to clarify the impact of science centers on the surrounding communities is needed. A lead role could be taken by the branch organizations (ASTC, ECSITE, etc.). The effort should address at least the following areas: liberation of and access to relevant proprietary data; assessment of research needs; and commissioning of research projects involving science centers and the relevant academic communities.

REFERENCES

Ansbacher, T. 1998. John Dewey's Experience and Education: Lessons for museums. *Curator* 41:36–49.

Barriault, C. 1998. The science center learning experience: A visitor-based framework. M. Sc. Thesis, Glamorgan University, Techniquest, Cardiff, Wales.

Borun, M., A. Cleghorn, and C. Garfield. 1995. Family learning in museums: A bibliographical review. *Curator* 38:262–70.

Coventry, V. 1997. Major influences on career choice. Unpublished memo, Scitech Discovery Center, West Perth, WA, Australia.

Falk, J. H. 1999. Assessing learning in a learning society. In Giant screen films and lifelong learning, a preconference symposium, 18–20. Giant Screen Theater Association. Suppl. to *Informal Learning Review* 38.

Falk, J. H., and L. D. Dierking. 1992. *The Museum Experience*. Washington, DC: Whalesback Books.

Falk, J. H., T. Moussouri, and D. Coulson. 1998. The effect of visitors' agendas on museum learning. *Curator* 41:106–20.

Karp, I., and S. D. Lavine. 1993. Communities and museums: Partners in crisis. *Museum News* 72 (3):44–45, 69, 79–84.

Meredith, J. E., R. W. Fortner, and G. W. Mullins. 1997. Model of affective learning for nonformal science education facilities. *J. Res. Sci. Teaching* 34:805–18.

Persson, P.-E. 1993. Hands-on exploration of science. In K. Ackrill, ed. *The Role of the Media in Science Communication*, 63–73. London: Ciba Foundation Discussion Meeting.

———. 1999. Science centers: A motivational asset. Paper presented at the UNESCO and ICSU World Conference on Science, Budapest, Hungary, June 28.

———. 2000a. Science centers are thriving and going strong! *Public Understanding of Science* 9(4):449–60.

———. 2000b. The changing science center: Sustaining our mission into the 21st century. *ASTC Dimensions* (Jan/Feb):3–6.

Salmi, H. 1993. Science center education. Motivation and learning in informal education. Univ. Helsinki, Dep. Teacher Educ., Res. Rep. 119, 1–202.

———. 2000. Career choices and Heureka. Unpublished memo (in Finnish). Heureka, Finland: The Finnish Science Center.

Serrell, B. 1997. Paying attention: The duration and allocation of visitors' time in museum exhibitions. *Curator* 40:108–25.

Stevenson, J. 1991. The long-term impact of interactive exhibits. *Int. J. Sci. Edu.* 13:521–31.

Urwick, Currie, and Partners. 1974. *An Assessment of the Impact of Selected Large Performing Companies Upon the Canadian Economy*. Ottawa, Canada: The Canada Council.

Woolnough, B. E. 1994. Factors affecting students' choice of science and engineering. *Int. J. Sci. Edu.* 16:659–76.

Web sites:

http://www.artsusa.org/clearinghouse/
http://astc.org
http://ecsite.net